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The

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VOL. XXXVIII DECEMBER, 1955 NO. 4

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STARTING THE SECOND CENTURY OF PROFESSIONAL ENTOMOLOGY[1]

F. GRAY BUTCHER
University of Miami, Coral Gables, Florida

Preparing a presidential address has certain similarities in its development to the normal course of events associated with the birth of a baby. Thus, there is a momentary pleasure in the conception of the assignment, i.e., the recognition of the honor of being elected to this office. Sometime later, there follows the sudden realization that the thing must be delivered a few months hence; periods of near hysteria at the thought of the awful ordeal alternate with periods of unrealistic optimism that the item will work its way out in some effortless manner. As the fateful deadline approaches more closely, unmistakable signs of anxiety crease the face of the unfortunate individual concerned, and there is a conspicuous protrusion into thoughts and activities more properly devoted to other duties. Eventually, after many wakeful hours, much pain, and real labor, the hour of delivery arrives, and the new-born becomes an entity unto itself, to stand or fall, and to take its place with others of its kind. From such a procedure, I wish to present some thoughts to you regarding our Profession.

In this first year of the second century of Professional Entomology, we are still thrilling to the complimentary centennial reports of the accomplishments of our profession. We are proud to have helped increase production of food and fibre to more adequately feed and clothe the people of the world; we are proud that entomology has justly earned a position of high repute in the field of public health; and we are proud that our profession has developed a well-rounded procedure of experimentation, adaptation, and education for meeting the various pesticidal demands of agriculture and industry.

These accomplishments of the last century are well worth our pride in their enumeration, and we would have been remiss in our allegiance and loyalty to the founders and early workers in this field had we not participated in our Centennial Celebration. Fortunately that recent activity has well recorded our

[1] Presidential Address delivered at the thirty-eighth annual meeting of the Florida Entomological Society, September 1, 1955, at Jacksonville, Florida.

professional development, and those records now stand for our intimate and personal review as we search for inspiration and guidance in our continuing endeavors.

Now it is time to get back to work again. Insect problems confront us; essential food is being destroyed; available pesticides fail to provide adequate needed protection; diseases of man and animals which appear to be insect-borne mock us with wasted energy devoted to non-productive growth; the great mass of laymen outside of our profession are unversed in the ways of insects and in methods of preventing their depradations. As long as these conditions exist, our job requires full-time attention.

My students wonder why counting antennal segments or studying wing venation cannot be eliminated as an approach to lessons in applied entomology. My administrative supervisor is irritated at the delay in naming the species of maggot found in a mango fruit; my next door neighbor is displeased with the necessity of protecting his papaya fruit with cheese-cloth bags to keep fruit flies away. These and similar items are the normal components of our profession, and are readily explained and understandable by the trained entomologist. But what about other common questions? Do house flies or other insects carry the viruses of polio? Have Dade County chinch bugs really developed an immunity to chlorinated hydrocarbons? Can we avoid another establishment of a pest like the khapra beetle within our borders? I do not know any co-workers willing to answer such inquiries, even tho the answers to these types of questions are of prime importance to many segments of the general public.

Ours is an exciting profession in its various facets. To call ourselves trained entomologists we must first have thrilled to the pleasures of time allotted to observing *Sphex* dragging caterpillars to her nest; or to watching the mature nymph of *Tibicen* crawl from its underground home to the bright light of day and adult-hood; or to the countless other experiences in getting acquainted with details of insect habits. As teachers in the halls of learning, it is our privilege to lead students into paths of inquiry which eventually become main thorough-fares of knowledge. As research workers with insect problems, we find unlimited avenues for accomplishments that can dis-credit Wadsworth's suggestion that we are "lost in the gloom of un-inspired research". We make the first record of a complete life history,

we correct an earlier hypothesis of relationship, we see the rearrangement of a molecule on the structural formula improve an insecticidal compound. In short, our field of work leads to accomplishments of varying degree, all of which bring real personal satisfaction that may not be apparent to the layman.

But the layman is still our staff of life, and servicing his demands is our ultimate assignment. Although entomological knowledge is vastly greater among the general public than it was a few years ago, there is ample evidence that we must recognize that much of their information is in-adequate or incorrect. A few months ago a lady was quite concerned because each day she found a new group of an insect form on her porch in spite of continued treatments of the floor and walls with a good household spray. Her concern changed to interest and amazement when specimens she brought were recognized as lace-wing flies which had been trying diligently to cope with pests on her nearby foliage plants. A home-owner was quite disgusted recently when I could not answer his telephoned request for a spray to kill big beetles eating his lineoleum floor covering until he brought a specimen and found it was the cerembycid adult *Eburia* merely escaping from its larval home in the flooring under the lineoleum. All of you have encountered similar experiences revealing a continuing need for adequate layman education of accurate entomological information.

Where do we go from here? I would dedicate this thirty-eighth annual meeting of the Florida Entomological Society to the industrious pursuit of our profession in deliberate contest with our forebears. While our numbers have grown, there is adequate work for all. Let those of us who are teachers enlarge our perspective to encompass the vision of imparting more complete training of our students to stimulate their greater curiosity in the fundamentals of entomological subject matter, and to encourage their continued interests in this field in its relationship to all other vocations and professions. Let those of us who are research workers enlarge our perspective to include a complete critical analysis of established procedures and practices associated with our fields of interest, and apply earnest efforts to devise thorough study of all factors capable of manipulation in determining true factual information. Let those of us who are in the realms of public relations of our profession enlarge our perspective to keep abreast of research findings and adapt the same to a practical demonstration of accurate information for

the layman, and to continually visualize the relationship of entomology in the every-day life of our neighbor.

An important segment of our profession, which is integrated with all of the interests just enumerated, is the group collectively designated as "Industry Representatives". This group has the most extensive contact with the general public, and thus is in a position to acquaint the layman with our profession and its operation. This group has done an outstanding job in this assignment to date, and thus merits the high esteem with which it is held both by other segments of our profession and by the layman. The position of this group in this respect dictates the necessity for continued honest and industrious attention to accurate information, as well as the critical direction of efforts for the rest of us to interpret with accuracy the major public demands, and the maintenance of wholesome relationships with the entire profession.

As we visualize the tremendous strides between Harris' old recommendation in his 1841 "Report on Insects Injurious to Vegetation" for such measures as protecting woodpeckers for control of tree borers, to the recent and very exciting control of screwworm fly by release of irradiated males there is just cause for pride of accomplishment. On the other hand, we must humble ourselves in acknowledging the many unanswered entomological questions, and industriously contribute our best efforts to even greater accomplishments during this Second Century of Professional Entomology.

PROGRESS OF THE COOPERATIVE ECONOMIC INSECT SURVEY PROGRAM[1]

KELVIN DORWARD[2]

Many of you are aware of the Cooperative Economic Insect Survey program and we trust that you have actively participated in this cooperative undertaking during the past few years. It is a program for all entomologists and perhaps an explanation of the developmental background, the objectives, accomplishments and an expression of our hopes for the future will better inform those of you who have been cooperating of the value of your contribution. We also hope that others will be encouraged to assist with the program by submitting regularly, current insect notes.

The Insect Pest Survey, initiated by the late J. A. Hyslop in 1921, was active for many years and demonstrated what a group of entomologists working together might accomplish by providing insect condition information. During the early years information was submitted by a number of appointed collaborators (serving without pay) and released once each month. The information obtained was important and made possible the accumulation of many valuable records. A reduction in funds and personnel had restricted the program to such an extent that by World War II much of its original effectiveness was lost.

Following World War II the many aspects of Biological Warfare created national interest in the dangers from the possible intentional introduction of insects and diseases affecting humans, animals and plants.

Prompted by this outlook, the Federal Civil Defense Administration in 1950, requested the Department of Agriculture to utilize its facilities to carry out certain functions in the National Program of Civil Defense—particularly with respect to the measures necessary to protect this country against the intentional introduction and spread of diseases and pests of livestock, crops and forests. The Department of Agriculture assumed a large measure of the responsibility for this assignment through modification and strengthening of the peacetime procedures. To

[1] Presented at the 38th annual meeting of the Florida Entomological Society, September 1-2, 1955.

[2] Head, Economic Insect Survey Section, Plant Pest Control Branch, Agricultural Research Service, United States Department of Agriculture.

facilitate the program, the Secretary of Agriculture directed the Administrator of the Agricultural Research Service to assume the major responsibility insofar as the Department was concerned. Within the research service the Bureau of Entomology and Plant Quarantine was the qualified Bureau to assume the phase of the program dealing with insects.

Realizing the need for current information on economic insect pests in normal times, as well as in times of emergency, Dr. Avery S. Hoyt, Chief of the Bureau of Entomology and Plant Quarantine, in April, 1951, sent letters to the Directors of Extension, Directors of Experiment Stations, and the Commissioners, Directors and Secretaries of Agriculture of each State requesting suggestions for strengthening insect pest surveys through cooperation of all entomological agencies. In the original correspondence, it was suggested that the various entomological agencies in each State not so organized might give consideration to the possibility of establishing a central point or a clearing house for screening insect specimens and reports on insect occurrence or abundance within the respective States. It was also suggested that such information be transmitted to the Bureau in Washington for permanent record and for incorporation into a national report. This report would be issued at frequent intervals for the mutual information and benefit of all entomologists, agricultural workers and the pesticide and related industries throughout the country. The response to Dr. Hoyt's letter was excellent and it is with pleasure I tell you that almost immediately Mr. Arthur C. Brown, Plant Commissioner at that time, Mr. W. M. Fifield, Director of Experiment Stations and Mr. H. G. Clayton, Director of Extension, met and discussed the suggested cooperative work in Florida. At that meeting the office of Mr. Brown was selected to act as coordinator and clearing house for insect information from Florida.

By the end of 1951, 35 States had established central clearing houses and others indicated that steps were underway to organize. In addition to the cooperative plans with the States, the territories of Alaska, Hawaii and Puerto Rico similarly organized and a cooperative arrangement with Canada was effected.

To further determine the desire of entomologists of this country for such an undertaking a special session on surveys was held at the 1951 Cincinnati Meeting of the American Association of Economic Entomologists. It was apparent at that session that such a program was necessary and acceptable to the entomolo-

gists of this country. The Association, in order to assist in such an undertaking, appointed an interim survey advisory committee consisting of six members. It included one representative each from the Experiment Stations, State regulatory agencies, Extension Entomology, Industry, the Bureau of Entomology and Plant Quarantine with the head of the Federal survey program as ex-officio. Incidentally, at the 1954 meetings of the Entomological Society of America, in Houston this Committee was designated as a permanent committee and enlarged to 10 members with the addition of Public Health, Forest Entomology and the Entomology Research Branch and as an ex-officio member the head of the Federal Insect Identification and Parasite Introduction Section.

The evident interest of the States and entomological workers made it apparent to the Bureau that such a cooperative program was acceptable and needed and would be supported. With this assurance, the Bureau on January 18, 1952, announced the formation of an Economic Insect Advisory Service for the purpose of developing such a program. The Section headquarters are maintained in Washington where the weekly Cooperative Economic Insect Report is compiled and released and where the permanent records are maintained. At the outset, five regional men were assigned to the field to coordinate the program within the regions and work with entomologists to stimulate participation in the program. Mr. F. S. Chamberlin was originally assigned the southeastern region but has since returned to tobacco insect research. The areas were enlarged this year and the supervisors reduced to four with Mr. J. I. Cowger being assigned Mr. Chamberlin's territory in addition to some of the southwestern states formerly worked.

The original thinking behind the program was for a completely voluntary undertaking. The voluntary cooperation has been outstanding with more than 400 entomologists contributing information in 1952. This number was over 600 in 1954. From the outset, the states have been encouraged to make timely releases of insect condition information within the state to permit the timely and orderly use of the information. Please don't misunderstand me—weekly releases on insect conditions were being issued by some of the states long before this program was conceived. It is felt, however, that either directly or indirectly the cooperative survey program has been responsible for the inauguration of several weekly reports. Presently about three-fourths

or more of the States issue some type of information release on current insect conditions. It would be an important milestone in economic entomology if each State would report on current insect conditions periodically.

It was mentioned previously that in the beginning this cooperative undertaking was entirely upon a voluntary basis. A majority of the reports still come from voluntary contributors but in some States the Plant Pest Control Branch has entered into a cooperative survey agreement which provides for joint State-Federal financing of the cost of one entomologist on the survey program. This agreement may include one or more state agricultural agencies. This aspect of the program has been made possible by the reassignment of funds formerly allocated to specific surveys, such as the European corn borer, cotton insects and a limited number of others.

During and since World War II these federally-financed survey programs were known as Service Surveys and the purpose for their origin was to insure the most effective distribution of the limited supplies of insecticides, and to enable farmers to protect their crops through the aid of timely information.

All of the Service Surveys were under the supervision of Entomology Research Divisions and their operation utilized time needed for other work; therefore, the administrative responsibility for the survey activities (exclusive of control project surveys) was gradually transferred to the Economic Insect Survey Section. It was recognized that the specific emergencies dealing with the establishment of such surveys no longer existed and the question was frequently asked why these funds were not used to service a wider range of crops and cover other economic insects in additional States.

Predicated on this philosophy, attention was focused on a new phase of the survey program in the spring of 1953. The plans, of necessity, required the development of a much broader program that could be operated for approximately the same amount of money. This problem was presented to the Advisory Committee of the Entomological Society of America for consideration and recommendations. The Committee proposed that the Service Surveys be replaced by a program in which survey personnel would be jointly financed by the State and Federal Governments and conduct surveys designed to cover the more important crops and economic insects. This type of program was concurred in by the Bureau and the Section as well as by the States with which

it was discussed. The program involves sharing the over-all cost of one survey man on approximately a 50-50 basis between the State and the Plant Pest Control Branch for the active insect survey season. The survey entomologist, as a State employee, operates under a work plan acceptable to the cooperating agencies and in addition to making routine and special surveys, works to improve the voluntary aspects of the program. Weekly reports are submitted through the State Clearing House to insure compliance with the agreement. By mutual consent the cooperators may be the Extension Service, the Experiment Station or the State Department of Agriculture or any combination of the three. This program is accomplished through a cooperative agreement, or contract which is renewable annually or may be revoked by either cooperator on 60 day's notice. It is again with pleasure that I can say that Florida was one of the first states to sign a cooperative survey agreement. As you know, Mr. H. A. Denmark is the cooperative survey entomologist and has been doing a very creditable job. The agreement is with the State Plant Board and the entire state financing is from that source. To illustrate the cooperative spirit that entered into the Florida agreement, Mr. Ed L. Ayers, discussed the program with both the Experiment Station and Extension Service prior to signing. In developing the work plan representatives of the three agencies met with a representative from the Plant Pest Control Branch and discussed the work plan to be followed for the program. Twenty-two states have entered into cooperative agreements and at the present time active negotiations are in progress in four others.

You are probably asking, what has been accomplished? First, I might say that each state has a better knowledge of its insect problem and most States are doing a better job of keeping their agricultural interests informed. The Cooperative Economic Insect Report, issued weekly, is sent to over 2600 entomologists, agricultural workers and industry representatives in each of the states in addition to several foreign countries. Too, on a national level a permanent insect file is maintained for use of the public which consists of more than 500,000 notes on 11,500 domestic genera which includes more than 24,000 species and on 8,000 foreign genera including 20,000 species. Over 2,000 host plant species references are maintained.

Our cooperators have consistently increased and improved their notes and the coverage of insect conditions within the

States. In 1954 we received 1,297 clearing house reports (exclusive of reports from PPC Branch, Entomology Research Branch, Forest Service and Agricultural Marketing Service) from more than 600 contributors; State summaries from 36 States; a list of the ten most important insects from 23 States. We have prepared and published special reports or summaries on such insects as armyworm, yellow clover aphid, grasshoppers and Mormon crickets, chinch bugs, European corn borer (abundance and loss estimates), forest insects, etc.

One very graphic illustration can illustrate the monetary value of the work that is being done. The advance reports received by the State of Pennsylvania during the armyworm outbreak in 1953 is credited by entomologists with saving the farmers over $1,000,000 in losses. Of course other states have received similar if not as marked benefits.

The Section has cooperated with the States and other agencies in several specialized detection surveys including the European chafer in the mid-western and northeastern States and the cotton stem moth and Matsucoccus scale in the Eastern and Northeastern States. The European corn borer and the khapra beetle surveys in the Western States were conducted at the request of the Western Plant Board. Program or project surveys such as grasshopper, pink bollworm of cotton, Japanese beetle and others are made by the projects concerned, but the information obtained is also made available through the Cooperative Economic Insect Report. There will be numerous occasions, some of an emergent nature, when other special surveys will be necessary.

What of the future? One of the most pressing questions is that which pertains to the prediction of insect situations. On several insects it is possible to give an indication of what to expect, but such information is needed on many others. What about insect loss figures? We need more information on the losses caused by insects and by other pests. True, on some insects we have some figures and in some cases we are not afraid of them but in the majority of cases we shake our head and just hope no one asks us for justification. Improved survey methods are badly needed. We are fortunate that economic and research entomologists have developed so many methods but still more are needed which can be applied on a universal basis. Tests of course are under way. Perhaps the largest scale test program under way at the present time is the study in relation to light

traps. In cooperation with the Farm Electrification Section of the Agricultural Engineering Research Branch, traps are being tested in several Southern and Southeastern States. Florida was one of the first to enter this program and Mr. Denmark is to give us a discussion on the program in this State. I would also like to compliment Mr. Denmark and others on the fine work they are doing in developing a card system for recording insect data. The use of IBM or some type of card system is receiving more and more attention throughout the country. The coding system is the important phase as the mechanical system is only a means of fast utilization of the records. In this connection it might be well to mention that considerable interest is developing in the adoption of a uniform coding system for use by entomologists and other scientific workers.

You can see that this program has many ramifications. It needs the cooperation of all entomologists. Before closing I would like to read the objectives which were outlined when the work was first started and it is believed that the same objectives still apply to this cooperative program.

(1) To assist farmers and other agricultural workers to more adequately protect their crops from insect attack by supplying current information on insect activity.

(2) To aid manufacturers and suppliers of insecticides and control equipment to determine areas of urgent need for supplies and equipment.

(3) To aid and assure more prompt detection of newly-introduced insect pests.

(4) To develop a workable insect pest forecasting service.

(5) To develop nationwide uniformity in reporting insect conditions.

(6) To determine the losses caused by insects.

(7) To maintain records on the occurrence of domestic and foreign economic insects.

(8) In case of necessity, provide a nation-wide basic structure for biological warfare defense.

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NEW MUSCID FLIES FROM FLORIDA AND THE WEST INDIES (DIPTERA: MUSCIDAE)

Harold R. Dodge [1]
Communicable Disease Center, Public Health Service, U. S. Dept. of Health, Education and Welfare, Atlanta, Ga.

The genera *Philornis* and *Neomuscina* are Neotropical; both occur in southern Texas, but heretofore they have been unknown in the Southeastern States. The following two new species of these genera have been taken by fly trap in southern Florida. One of the species is known to occur also in the West Indies. The types are deposited in the U. S. National Museum; paratypes will be distributed to the Communicable Disease Center Museum, the American Museum of National History, and in the collections of Dr. F. M. Snyder and the author.

Philornis Meinert

Members of this genus are parasitic on birds, especially nestlings of the smaller songbirds, according to present knowledge. There is but one record from a pullet of the domestic hen, and none are recorded from waterfowl or birds of prey. The genus is badly in need of revisional work. The following species appears to differ from those previously described by having the fourth apparent tergite of the abdomen broadly reddish. It also differs from other material before me by the presence of "beret hairs" on the dorsal extremity of the hypopleuron anterior to the metathoracic spiracle. All species examined have a similar small group of hairs on the postero-ventral aspect of the hypopleuron immediately above the hind coxa.

Philornis porteri, new species

Length 9 to 11 mm; wing 8 to 10.5 mm.

Male: Head dark, with silvery grey pollen, the frontal stripe and antennae reddish. Eyes large, reddish, bare. Front at narrowest 0.05 to 0.07 of head width (average 0.066 of three); at vertex 0.07 to 0.09 and at lunule 0.24 of head width. Frontal rows of 14 bristles, reduced in size at narrowest part of front. Frontal stripe linear on posterior half of its length, narrowly triangular anteriorly, dull black to reddish brown in color. Parafrontals and parafacials narrow, bare, grey pollinose. Frontal lunule yellowish, non-setose, thinly pollinose. Antennae reddish brown, the third segment more than twice the length of the second and three times as long

[1] Now with the U. S. Forest Service, Missoula, Montana.

as wide. Arista half again as long as antenna, long plumose nearly to tip, the upper and lower rays of equal length; second segment of arista slightly longer than its diameter. Clypeus shallowly depressed, not carinate, with faint antennal depressions. Vibrissae separated by a distance greater than the length of the third antennal segment, situated slightly above the epistoma. Frontal ridges setuled less than half the distance to base of antennae. Cheeks black haired, one sixth of eye height. Occiput slightly concave, with whitish vestiture and one row of black postocular setae. Verticals small, the outer pair larger; ocellars proclinate, as large as outer vertical bristle. Palpus reddish brown, slender, flattened, nearly as long as antenna, with rather numerous, short, recumbent bristles dorsally and a few long, erect bristles ventrally on outer side; inner side bare.

Thorax dark, grey pollinose, with four blackish stripes dorsally which nearly reach the scutellum and a pair of short lateral stripes above the notopleurae. Scutellum uniformly pollinose; humeri concolorous with the thorax or yellowish. Thoracic spiracles yellowish, with distinct apertures, the posterior pair with a few black, recumbent setules in the lower margin. Chaetotaxy: acrostichals 0:1, dorsocentrals 2:4 (3:5 in one specimen); intra-alars 1:1; supra-alars 1:3, the prealar half the length of the following bristle and two-thirds as long as the posterior notopleural; humerals 3, in a nearly transverse line, the outer one largest; notopleurals 2, each surrounded by numerous hairs, sternopleurals 1:2; posterior callus 2; scutellum with 3 pairs marginals, 2 pairs discals, no apicals, and with some ventral yellowish hairs on the sides at base. Propleuron, prosternum and metasternum bare; pteropleuron with numerous hairs; hypopleuron with two small hair groups, one above the hind coxae and the other at the dorsal extremity of the sclerite. Supraspiracular convexity with erect pubescence; infrasquamal setules absent; postalar declivity with a group of hairs. Halter pale yellow.

Wing hyaline, veins brown, without setules. Costal segments 1-5, respectively, 1.5/2.4/1.6/3.3/1.2. Anterior cross vein slightly beyond middle of discal cell; apical cell diverging apically, the third vein slightly bowed forward at the middle of its length and fourth vein slightly bowed backward subapically, the apex of the vein in line with its course before the bend. Basicosta yellowish; epaulet darker brown; squama white, the upper lobe has a darkened margin.

Legs yellowish red, including the coxae; tarsi darker. Fore femur with 2 complete posterodorsal and one posteroventral rows of strong bristles and a very weak row of about 5 anterior bristles on basal half; fore tibia with 2 dorsal preapicals and 1 posteroventral preapical bristle, a complete anterodorsal row of short bristles, and an anteroventral streak of yellow hairs on the apical third of its length. Middle femur with an anterior row of about 9 bristles on the basal half, of which the last bristle is conspicuously stouter, 5 or 6 weak anteroventrals on basal third, a complete posteroventral row, of which those on basal half are erect and the distal three are stoutest, a weak posterior row of about 8 bristles on apical half and two strong posterodorsal preapicals, each longer than diameter of the femur; middle tibia with 2 strong posterior bristles at middle of length, a posterodorsal at apical quarter, and apically with 1 dorsal and 6 on ventral half, of which 2 are the longest bristles on any leg. Hind femur with complete

anterodorsal and anteroventral rows, of which those on apical half are strongest, and anterior bristle at middle of length, 1 dorsal preapical, and 6 fine posteroventrals on basal half; hind tibia with 1 strong anterodorsal and about 5 anteroventrals at about the middle of its length and 6 apicals on anterior surface, of which 2 are longer than its diameter, the posterior surface without bristles. Tarsi simple, dark brown, basal segment longest, 4th segment shortest, segments 3 and 5 of about equal length; claws simple, the claws and pulvilli about as long as the 4th segment. Hind coxae bare posteriorly.

Abdomen dark (partly brownish in some teneral specimens), with an irregular, changeable pollinose pattern, the apparent 4th tergite largely reddish, the reddish color continued to the base of the segment middorsally in some specimens. Intermediate segments each with a median elongate darker pollinose spot. Tergites 1-3 with lateral bristles only; fourth tergite with scattered bristles over the apical two-thirds of its surface. Fifth sternite yellow, pollinose, setose, with two small, shining, bare, widely separately processes on the posterior margin, which is weakly excised between them. Genital segments small, yellow pollinose, the first clearly divided into two parts, of which the basal is bare, the other strongly setose; each bears a spiracle on each side ventrally. The second genital segment is cleft broadly to its base by the perianal membrane. Both superior and inferior forceps broad, curved, flattened, their apices broadly truncate.

FEMALE: Similar to the male, except in genitalic characters and certain others as follows: Front wider, 0.16 to 0.17 of head width at narrowest (vertex), 0.30 at lunule, bristles of frontal row uniformly strong; frontal stripe wider than either parafrontal at every point of its length; parafrontals each with a row of hairs; vertical bristles of equal size. Fourth tergite without a marginal row or other bristles except a weakly differentiated, scattered row at basal third, the bristles becoming larger on the sides. Legs as in male except that 1) the claws and pulvilli are smaller, and 2) the hind femur lacks the anterior bristle, and has only the apical 3-4 anteroventral bristles strongly developed. Intra-alar bristles 1:2. Genital segments protruded in the females taken by bait trap, shorter than fourth tergite, without hooks or prickles, the cerci rather slender and shining.

HOLOTYPE MALE AND ALLOTYPE FEMALE: Miami Beach, Florida, Aug. 4, 1949, fly trap no. 4, J. E. Porter. Type no. 62775, U. S. National Museum.

PARATYPES: 2 males, 2 females, same data as above; 1 male, same data but July, 1949; 2 females, Miami, Florida, August 13, 1953, McPhail bait trap—Florida Plant Bd. 115 143, O. D. Link; 1 male, Orlando, Florida, July 5, 1947, at light, F. M. Snyder.

Neomuscina Townsend

This genus was revised by Snyder (1949, Amer. Mus. Novitates, No. 1404, 39 pp). Snyder (1954, Bull. Amer. Mus. Nat. Hist. 103 (6) : 424-429 reviewed it, with a key to 26 species of two subgenera. The following species is the first one known from Florida or the Greater Antilles.

Neomuscina (Spilopteromyia) rufoscutella, new species

Length 5 to 6 mm.

MALE: Head nearly twice as high as long, grey pollinose, dark with frontal stripe, facialia and cheek grooves reddish. Eyes large, bare. Front at narrowest 0.05 of head width, at vertex 0.13 and at lunule 0.21 of head width. Frontal rows of 11 well-developed bristles; frontal stripe linear posteriorly, diverging and reddish anteriorly. Parafrontals and parafacials narrow, silvery grey pollinose, not setuled. Ocellar bristles large; frontal lunule yellow; antennae reddish yellow, the second segment with 2 dorsal bristles, the 3rd over twice as long as the 2nd and thrice as long as wide. Arista dark brown, the basal segment yellow, the apical segment moderately long plumose its entire length; the lower rays are as long as the diameter of the 3rd antennal segment; the upper rays longer. Clypeus shallowly depressed, not carinate; epistoma warped forward and situated slightly below the vibrissae, which latter are separated by a distance slightly greater than the length of the 3rd antennal segment. Frontal ridge with fine setules half way to lunule. Cheeks black-haired, 0.23 of eye height. Occiput slightly concave, with 1 row of black postocular bristles, otherwise pale-haired. Verticals small, equal, about half as long as the ocellar bristles. Palpi yellow, flattened, slightly clavate, sparsely bristled, slightly shorter than antennae or haustellum, the latter yellowish.

Thorax dark, humeri yellowish and scutellum entirely reddish yellow; mesonotum grey pollinose, with 4 black stripes, the outer pair narrowly interrupted at the transverse suture and the inner pair extending half way from the suture to the scutellum, a short lateral stripe is present above the notopleuron. Thoracic spiracles with dark vestiture, the anterior closed, the posterior with aperture evident. Chaetotaxy: acrostichals 0:2; dorsocentrals 2:4; intra-alars 1:1; supra-alars 1:2, the prealar hair-like; humerals 3, in a nearly transverse line; posterior callus 2; notopleurals 2, with 1-2 setules near the anterior one; sternopleurals 1:2; scutellum with 2 strong marginals and a smaller bristle before the basal, discals 2 weakly differentiated pairs; ventral margin of scutellum setuled to apex. Propleuron and prosternum bare; pteropleuron haired; hypopleuron with a few supracoxal setules; supraspiracular convexity with fine, yellow, erect pile; infrasquamals none; postalar declivity with a group of hairs. Halter entirely yellow.

Wing slightly infuscated with yellow, especially along the costal margin and the veins; costal spine vestigial; costal sections 1 to 6, respectively, 3.7/7/3/9/3.5/1.4 Vein 1 with a basal setule ventrally; vein 3 setuled above and below half way to the anterior cross vein; vein 4 slightly curved forward anteriorly, ending behind the wing tip. Epaulet brown; basicosta yellow; subcostal sclerite yellow, bare; squamae grey-brown infuscated, the lower lobe whitish toward the base, the margins somewhat darkened.

Legs yellowish, including the coxae; tarsi darker. Chaetotaxy similar to *Philornis porteri,* except that the front femur has no anterior row, the middle femur with very weak posteroventral row and 3 subapicals; middle tibia bare anteriorly, with 2 posterior bristles and 2 large, 5 small apicals; hind femur with a complete anterodorsal row, an anteroventral row of about 10, of which the last 4 are large, a posteroventral row of about 12 on

basal half; hind femur with an anterodorsal and anteroventral bristle at middle and three strong apical bristles. Hind coxae bare posteriorly.

Abdomen dark with vague yellowish markings on basal half and the apex of the 4th apparent tergite vaguely reddish; in posterior view the silvery pollen is somewhat marmorate and tergites 2-4 have wide, dark spots confined to the basal halves of the segments. Intermediate segments with weak marginal rows and lateral bristles; fourth tergite with 2 rows of discal and 1 marginal row of bristles.

FEMALE: Similar to the male except for the usual sexual differences and the wings are not infuscated, the squamae white.

HOLOTYPE MALE AND ALLOTYPE FEMALE: Florida Keys, March 16, 1952, fly trap no. 21, Dodge and Seago. Type no. 62776, U. S. National Museum.

PARATYPES: 4 males, 12 females, same data as above; 10 females, Miami Beach, Florida, September 19, 1949, fly trap no. 8, J. E. Porter; 1 male, Merritt Island, Fla., January 20, 1948, F. M. Snyder; 1 female, Pinar del Rio, Cuba, May 5, 1953, Fernando de Zayas.

The reddish scutellum easily distinguishes this species. Its relationship to *Musca scutellaris* Fabricius, which Stein referred to the genus *Cyrtoneurina,* is unknown. Snyder (1954) believes that *scutellaris* may be a *Spilopteromyia.* The type locality is South America, and in Stein's redescription the color of the scutellum is not mentioned (Snyder, *in litt.*).

In Snyder (1954) the male of this species runs to *N.* (*S.*) *atincticosta* Snyder because the costal cell is clear and the following two cells are only slightly yellowed; the female wing is clear. It differs from *atincticosta* by the red scutellum and the vittate thorax. If the costal margin is considered darkened it runs to *transversalis* (Stein) (*lapsus calami* for *tinctinervis* Stein) on the basis of the margins of the squamae darkened.

Neomuscina (Spilopteromyia) rufoscutella farri, new variety

Length 5.5 mm.

FEMALE: Very similar to the preceding species but the legs are black, with only the apices of the femora brown. The body is uniformly black, instead of dark brown with some paler areas as in the typical species. The scutellum is red, its basal third black. Humeri, antennae, and palpi yellowish.

HOLOTYPE FEMALE: Clarendon, 1 mile West of Jacob's Hut, Jamaica, B. W. I., September 28, 1954, T. H. Farr. Type no. 62777, deposited in the U. S. National Museum by courtesy of the collector and of Dr. C. Bernard Lewis, Director, Science Museum, Institute of Jamaica.

The differences noted between this and the typical species are not considered specific, pending the discovery of additional material.

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EVALUATION OF REPELLENTS AGAINST MOSQUITOES IN PANAMA[1]

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Field evaluation of repellents against the various species of mosquitoes in Panama was made in February 1953 under the research program supported by the Army Committee for Insect and Rodent Control. Previous tests in the laboratory against *Aedes aegypti* (L.) and field studies against the salt-marsh mosquito *Aedes sollicitans* (Wlkr.) and *taeniorhynchus* (Wied.) had shown all the individual repellents and mixtures to be equal to or more effective than the standard repellent (M-250) against these species. Many of the repellents were also found highly effective against *Anopheles quadrimaculatus* Say and *Psorophora confinnis* (L.-Arr.) by Gilbert *et al.* (1955). Altman and Smith (1955) conducted similar stududies in Alaska against subarctic species of mosquitoes.

All tests were conducted in the vicinity of the Juan Mina, C. Z., field station of Gorgas Memorial Institute, in an old orange grove and along jungle trails. The relative abundance of various species of mosquitoes as shown by five representative collections made while testing was as follows:

Species	Number collected
Mansonia	
titillans (Wlkr.)	361
indubitans D. & S.	6
fasciolata (L.-Arr.)	2
nigricans (Coq.)	39
Anopheles	
albimanus Wied.	9
strodei Root	1

The testing period began near the end of the rainy season and continued into the dry season. Rains occurred daily during

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the first two weeks but only once during the last two weeks. The river level had dropped one foot at the dock of Juan Mina by the end of the test period.

MATERIALS

The names of the individual repellents and the formulas of the mixtures are given below, together with their Orlando code numbers for convenient reference.

INDIVIDUAL REPELLENTS

262	Dimethyl phthalate
375	1,3-Hexanediol, 2-ethyl-
3916	Dimethyl carbate
6168	Succinamic acid, *N*,*N*-diethyl-, propyl ester
15510	Senecioic acid, 2-[2-(2-butoxyethoxy)ethoxy]ethyl ester
17586	Benzamide, *o*-chloro-*N*,*N*-diethyl-
20023	Citral-malonic acid condensate No. 1
20034	3-Buten-1-ol, 1-(*o*-methoxyphenyl)-
20127	Mandelic acid, amyl ester
20145	Mandelonitrile, (3,4-methylenedioxy)-
20188	Cyclohexanecarboxylic acid, 1-hydroxy-, 2-propoxyethyl ester
20217	*o*-Toluamide, *N*,*N*-diethyl-
20218	*m*-Toluamide, *N*,*N*-diethyl-
20224	Mandelic acid, propyl ester
20241	Mandelic acid, allyl ester
20293	Piperonyl alcohol, *alpha-tert*-butyl-
20297	Benzamide, *o*-ethoxy-*N*,*N*-diethyl-

REPELLENT MIXTURES

M- 250	Standard mixture—262 (60%), 375 (20%), Indalone (20%)
M-1960	2-Butyl-2-ethyl-1,3-propanediol (30%), *N*-butylacetanilide (30%), benzyl benzoate (30%), Tween 80 (10%)
M-2020	262 (40%), 375 (30%), 3916 (30%)
M-2040	Undecenoic (undecylenic) acid (30%), *N*-butylacetanilide (30%), *N*-butyl-4-cyclohexene-1,2-dicarboximide (30%), Tween 80 (10%)
M-2042	375 (40%), 6168 (30%), 17586 (30%)
M-2043	262 (40%), 375 (30%), 6168 (30%)
M-2059	M-1960 (99%), lindane (1%)
M-2063	375 (50%), 20297 (50%)
M-2065	*N*-Butyl-4-cyclohexene-1,2-dicarboximide (29%), undecenoic acid (29%), *N*-propylacetanilide (29%), lindane (3%), Tween 80 (10%)
M-2066	*N*-Butyl-4-cyclohexene-1,2-dicarboximide (29.7%), undecenoic acid (29.7%), *N*-propylacetanilide (29.6%), lindane (1%), Tween 80 (10%)
M-2068	M-1960 (97%), lindane (3%)

SKF C-36 M-2020 (40%), zinc oxide (10%), Deltyl Prime (10%), Veegum (0.75%), Span 80 (3%), Tween 80 (2%), distilled water (34.25%) (oil-in-water emulsion)

SKF C-39 M-2020 (40%), zinc oxide (10%), Deltyl Prime (10%), Span 80 (2.4%), Tween 80 (1.6%), Veegum (0.25%), Pluronic F-68 (1.75%), distilled water (34%) (oil-in-water emulsion)

The chemicals with code numbers above 20000 were prepared in a special synthesis program at the Beltsville, Md., laboratories of the Entomology Research Branch, which has been discussed by Barthel *et al.* (1954), Leon *et al.* (1954), and McCabe *et al.* (1954). Mixtures SKF C-36 and SKF C-39 were lotions prepared by the Smith, Kline & French Laboratories under a contract with the Department of Defense.

TESTS WITH REPELLENTS APPLIED TO THE SKIN

A repellent was spread evenly over the forearm from wrist to elbow or the leg from ankle to knee, and compared directly with another repellent on the other arm or leg. The rate of application was usually 0.50 ml. for an arm and 0.75 ml. for a leg, but in tests with lotions varying amounts and concentrations were used. The treated arms and legs were exposed continuously to natural infestations of mosquitoes. Effectiveness was based on complete protection, that is, the time between treatment and the first confirmed bite (a bite followed by another within 30 minutes). Since there were no consistent differences in protection times between arms and legs treated with the same repellents, no distinction is made between results on different limbs in the following discussion. The relative effectiveness of a repellent was expressed as the ratio of the protection time of the test repellent to that of a standard. The ratio is a more reliable index than the actual protection time, which varies greatly between different hosts and different populations of mosquitoes.

TESTS WITH 16 INDIVIDUAL REPELLENTS.—A series of tests was conducted with 16 individual repellents in which each chemical was tested eight times (once on the arm and leg of each of four men), while the standard was tested 20 times (four to six times each test period and two or three times on the arm and leg of each man) and the data for each repellent were averaged. The results of the tests are shown in table 1. None of the repellents differed markedly from the standard, No. 375. Seven repellents appeared slightly more effective, showing ratios of 1.10 to 1.17, and two appeared slightly less effective, with ratios of 0.83.

TABLE 1.—RELATIVE EFFECTIVENESS OF 16 REPELLENTS AS SKIN APPLICATIONS AGAINST MANSONIA SP. (AVERAGE OF EIGHT REPLICATIONS, 20 WITH NO. 375.)

Repellent No.	Protection time (minutes) Range	Average	Ratio to No. 375
375	208-437	313	1.00
262	229-433	304	.98
3916	223-445	318	1.02
6168	226-398	311	.99
15510	228-368	291	.93
17586*	198-383	308	.98
20023	207-385	259	.83
20034	213-435	366	1.17
20127	248-418	344	1.10
20188	206-358	259	.83
20217	142-436	332	1.06
20218	252-462	349	1.12
20224	258-457	362	1.16
20241**	368-408	387	1.12
20293	253-421	361	1.15
20297	237-425	356	1.14

* Solid compound, tested as 80% solution in ethanol.

** Four replications; chemical caused skin irritation; average of 346 minutes obtained with No. 375 in concurrent tests.

TESTS WITH SEVEN MIXTURES.—A series of tests was conducted with the standard mixture (M-250), three mixtures that had proved better than M-250 against several species of *Aedes* (M-2020, M-2042, and M-2043), a mixture containing one of the new repellents (M-2063), and two lotions (SKF C-36 and SKF C-39). The experimental design employed was a round-robin series, i.e., each mixture was paired against each other mixture on opposite limbs of the same subject. An adjusted average protection period, which adjusts for individual variations between hosts and testing conditions, was computed by the following formula:

$$\text{Average Ti} = \frac{2Ti - Bi}{rn} + M$$

where Ti is the total protection time for all tests with repellent i, Bi is the total protection time for both repellents in all pairs in which repellent i occurred, n is the total number of repellents, r is the number of times each pair was replicated, and M is the grand mean of all protection times in the series. The results are given in Table 2. There were no marked differences between any

of the mixtures except the lotions, which were about half as effective as the others. The poor showing of the lotions was surprising, as they had been equal to the best of the other mixtures in tests against several species of *Aedes*.

TABLE 2.—RELATIVE EFFECTIVENESS OF SEVEN REPELLENT MIXTURES IN A ROUND-ROBIN SERIES OF TESTS AS SKIN APPLICATIONS AGAINST MANSONIA SP. (AVERAGE OF 36 TESTS.)

Mixture No.	Minutes to first bite		Ratio to M-250
	Range	Average	
M-250	156-459	328	1.00
M-2020	173-470	305	.93
M-2042	178-491	318	.97
M-2043	208-493	325	.99
M-2063	193-478	346	1.05
SKF C-36	114-304	195	.59
SKF C-39	106-223	180	.55

ADDITIONAL TESTS WITH LOTIONS.—Because of the poor showing of the lotions, two additional series of tests were conducted with them in comparison with M-2020, their principal repellent component. In the first series a 50-percent solution of M-2020 in ethanol was paired with an equal volume of each lotion, and in the second series full-strength M-2020 was paired with twice the volume of each lotion. These tests were conducted by the paired tests design, in which the experimental repellent was compared directly with M-2020 on opposite limbs of the same subject. The results are given in table 3. The pairings at full strength and equal volume, a portion of the data for these mixtures included in table 2, are repeated to complete the comparison. The two lotions were about equal to M-2020 at half strength or half the volume, confirming the tests in which they were half as effective as an equal volume of M-2020 at full strength.

COMPARISONS OF TWO MIXTURES WITH THE COMPONENTS OF EACH.—The results of paired tests to compare the two mixtures M-2020 and M-2063 with the components of each are given in table 4. No. 20297 was slightly more effective and No. 375 very slightly less effective than the 50-50 mixture of the two (M-2063). There was no evidence of activating action when the two compounds were mixed, as the protection time of the mix-

ture was not significantly increased over that to be expected from joint action of the combined repellents. Mixture M-2020 and its three components were all about equal in effectiveness, confirming the observations on the relative effectiveness of the ingredients given in table 1.

TABLE 3.—RESULTS OF PAIRED TESTS WITH TWO REPELLENT LOTIONS AND M-2020 AT DIFFERENT CONCENTRATIONS AND RATES OF APPLICATION.

Repellent No.	Percent concentration	Milliters applied		Minutes to first confirmed bite		Ratio to M-2020
		Arm	Leg	Range	Average	
			First series*			
M-2020	50	0.5	0.75	193-218	211	1.00
SKF C-36	100	.5	.75	161-264	207	.98
M-2020	50	.5	.75	172-216	197	1.00
SKF C-39	100	.5	.75	200-230	208	1.06
			Second series*			
M-2020	100	.5	.75	195-282	230	1.00
SKF C-36	100	1.0	1.50	201-291	236	1.03
M-2020	100	.5	.75	193-276	225	1.00
SKF C-39	100	1.0	1.50	206-298	234	1.05
			Third series**			
M-2020	100	.5	.75	209-440	317	1.00
SKF C-36	100	.5	.75	114-199	163	.55
M-2020	100	.5	.75	224-439	317	1.00
SKF C-39	100	.5	.75	106-209	180	.57

* Average of 10 tests.
** Average of 6 tests; a part of the data for these mixtures in table 2.

ACTIVATING EFFECT OF ALPHA-CYANO-2-FURANACRYLATE.—The results of paired tests to determine the activating effect of ethyl *alpha*-cyano-2-furanacrylate on repellent No. 262 and mixtures M-2020 and M-2063 are presented in table 5. The cyano-furanacrylate increased the effectiveness of all three repellents slightly.

REPELLENCY TO ANOPHELES ALBIMANUS.—During the tests with various repellents and repellent mixtures as skin applications against *Mansonia* sp., observations were made of biting by

TABLE 4.—COMPARATIVE EFFECTIVENESS OF TWO REPELLENT MIXTURES AND THE INDIVIDUAL COMPONENTS OF EACH AGAINST MANSONIA SP. (ALL WERE TESTED AT 50% CONCENTRATIONS IN ETHANOL. AVERAGE OF EIGHT REPLICATIONS.)

Repellent No.	Minutes to first bite		Ratio of component to mixture
	Range	Average	
M-2063	192-373	281	1.00
375	174-360	245	.89
M-2063	173-282	229	1.00
20297	208-368	275	1.20
M-2020	180-227	202	1.00
262	123-229	189	.94
M-2020	169-317	214	1.00
375	175-276	201	.94
M-2020	177-227	205	1.00
3916	163-216	191	.93

TABLE 5.—RELATIVE EFFECTIVENESS OF REPELLENT 262 AND REPELLENT MIXTURES M-2020 AND M-2063, ALONE AND WITH THE ACTIVATOR ETHYL ALPHA-CYANO-2-FURNANACRYLATE, IN PAIRED TESTS AS SKIN APPLICATIONS AGAINST MANSONIA SP. (AVERAGE OF EIGHT TESTS WITH ETHANOL SOLUTIONS.)

Repellent No.	Percent concentration		Minutes to first bite		Ratio to unactivated repellent
	Repellent	Activator	Range	Average	
262	50	0	140-177	159	1.00
	45	5	165-203	183	1.15
M-2020	50	0	130-199	169	1.00
	45	5	170-205	189	1.12
M-2063	50	0	149-233	197	1.00
	45	5	165-304	244	1.24

Anopheles albimanus. Bites by *albimanus* were recorded in 24 of the 600 tests. An attempt was made to compare the protection periods against the two mosquitoes in the few tests in which bites of both genera were received. The results are summarized in table 6.

TABLE 6.—RELATIVE EFFECTIVENESS OF REPELLENTS AGAINST MANSONIA SP. AND ANOPHELES ALBIMANUS.

Repellent No.	Number of observations	Minutes to first bite		Ratio of repellent time
		Anopheles	Mansonia	Mansonia to Anopheles
262	2	244	248	1.02
262*	1	214	228	1.07
375*	1	216	189	0.87
6168	1	257	269	1.05
17586	1	254	243	.96
20297	1	236	225	.95
20297*	1	377	389	1.03
M-2020	4	224	219	.98
M-2020*	5	211	211	1.00
M-2043	1	274	281	1.03
M-2063	1	389	426	1.09
M-2063*	1	211	222	1.05
SKF C-36	3	224	236	1.05
SKF C-39	1	217	243	1.12

* 50% repellent in ethanol.

Although four percent of the tests is hardly an adequate proportion on which to draw conclusions, the results indicate that protection times of the repellents were about the same for both genera of mosquitoes.

TESTS WITH REPELLENTS APPLIED TO CLOTHING

Eight relatively new compounds and six all-purpose mixtures were tested as clothing impregnants by the stocking technique, and the mixtures were also tested on shirts.

In these tests cotton stockings were treated with two grams of the individual repellents or 3.6 grams of the mixtures per square foot. The individual repellents were applied in acetone solutions and the mixtures in water emulsions. About 50 ml. of solution or emulsion were used to saturate a single stocking. The stockings were hung on lines on a screened porch and tested concurrently after various intervals of aging. At each test the stockings were exposed for 10 minutes on each of three hosts. Stockings were dropped from testing when on an average five bites per exposure period were received. The mixtures and the better individual compounds were also tested at reduced dosages.

The results of the tests are presented in table 7. Of the eight individual compounds tested, only three (20127, 20297, and 15510) had less than five bites per test period after seven days of aging. Repellent 20127 at two grams per square foot was comparable to M-1960 at 3.6 grams after seven days of aging, but less effective after 14 days, and the two were roughly comparable at correspondingly reduced dosages after four days.

TABLE 7.—COMPARATIVE EFFECTIVENESS OF EIGHT INDIVIDUAL REPELLENTS AND SIX MIXTURES APPLIED TO STOCKINGS AGAINST MANSONIA SP. (AVERAGE OF THREE REPLICATIONS.)

Repellent No.	Dosage (grams per sq. ft.)	Average number of bites after aging		
		4 days	7-8 days	14 days
20127	2	....	0	38.1
	1	2.2	....	....
	0.5	22.8	....	....
20297	2	....	3.2	23.7
	1	11.3	....	....
15510	2	....	4.5	21.2
	1	14.2	....	....
20241	2	....	12.3	....
20188	2	....	13.5	....
20219	2	....	13.7	....
20217	2	....	17.7	....
20145	2	....	25.3	....
M-1960	3.6	....	.3	5.3
	1.8*	6.9	27.3	....
	.9	14.9	....	....
M-2059	3.6	....	.2	7.5
	1.8	7.0	....	....
	.9	15.3	....	....
M-2068	3.6	....	0	5.7
	1.8	17.6	....	....
	.9	20.9	....	....
M-2040	3.6	....	1.5	5.5
	1.8	4.2	10.7	....
	.9	15.7	....	....
M-2066	3.6	....	.9	5.9
	1.8	3.5	9.5	....
	.9	4.9	38.4	....
M-2065	3.6	....	.6	4.4
	1.8	3.8	23.1	....
	.9	7.6	....	....

* 5 replications of all mixtures at this dosage.

The standard general-purpose clothing treatment (M-1960) and the related lindane mixtures (M-2059 and M-2068) were about equal to M-2040 and its related lindane mixtures (M-2065 and M-2066) at dosages of 3.6 grams, but at reduced dosages M-2065 and M-2066 were distinctly better than the others. The different proportions of lindane in the mixtures caused no consistent differences in their effectiveness.

TESTS WITH IMPREGNATED KHAKI SHIRTS.—Three heavy khaki shirts were impregnated with the six mixtures at 3.6 grams per square foot. The mixtures were applied as water emulsions, about 500 ml. being needed to saturate a shirt. Each shirt was tested on the 10th, 17th, 20th, and 24th days after treatment. It was exposed for ten minutes on each of three subjects. Four untreated shirts were used as controls.

The results of the tests are given in table 8. There was little consistent difference in effectiveness between the six treatments during the first 20 days. The relative effectiveness varied from day to day, but the average number of bites was usually less than five. After 24 days all the mixtures had lost much of their effectivensss. M-2040 appeared slightly better than M-1960, but the lindane mixtures related to M-2040 were slightly less effective than those related to M-1960.

TABLE 8.—COMPARATIVE EFFECTIVENESS OF SIX REPELLENT MIXTURES APPLIED TO SHIRTS AGAINST MANSONIA SP. (AVERAGE OF THREE REPLICATIONS.)

Repellent No.	Average number of bites after aging			
	10 days	17 days	20 days	24 days
M-1960	0.4	3.4	1.7	15.9
M-2059	.2	2.7	3.8	10.8
M-2068	.7	.2	2.3	8.2
M-2040	2.1	2.3	5.2	10.9
M-2066	.8	1.3	2.9	20.2
M-2065	.2	5.8	3.9	13.6
Check*	44.2	61.7	55.7	....

* 4 check shirts used.

SUMMARY

Field tests with mosquito repellents were conducted in Panama in February 1953 against mixed populations of *Mansonia titillans* (Wlkr.), *M. indubitans* D. & S., *M. fasciolata* (L.-Arr.),

M. nigricans (Coq.), *Anopheles albimanus* Wied., and *A. strodei* Root. Tests were made with 16 individual repellents and seven repellent mixtures for application to the skin, and with eight individual repellents and six mixtures for application to the clothing.

Of the 16 individual repellents tested on skin, none differed very markedly in effectiveness from 2-ethyl-1,3-hexanediol. The seven that appeared slightly more effective were *N,N*-diethyl-*m*-toluamide, *o*-ethoxy-*N,N*-diethylbenzamide, 1-(*o*-methoxyphenyl)-3-buten-1-ol, *alpha-tert*-butylpiperonyl alcohol, and the amyl, allyl, and propyl esters of mandelic acid.

There were no marked differences between any of the mixtures except the two lotions, which were about half as effective as the others. The lotions contained 40 percent of repellent. There was no evidence of synergistic action between *o*-ethoxy-*N,N*-diethylbenzamide and 2-ethyl-1,3-hexanediol, or between 2-ethyl-1,3-hexanediol dimethyl phthalate, and dimethyl carbate in a mixture. Ethyl *alpha*-cyano-2-furanacrylate slightly increased the effectiveness of dimethyl phthalate and two mixtures.

In a few tests in which biting by *Anopheles albimanus* as well as *Mansonia* sp. was recorded, the protection times were about the same against both species.

The three most effective individual repellents for application to the clothing were the amyl ester of mandelic acid, *o*-ethoxy-*N,N*-diethylbenzamide, and the 2-[2-(2-butoxyethoxy)ethoxy]-ethyl ester of senecioic acid. A mixture containing undecenoic (undecylenic) acid, *N*-butylacetanilide, *N*-butyl-4-cyclohexene-1,2-dicarboximide, and Tween 80 appeared slightly better than the other mixtures.

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SAMPLING OF INFESTATIONS OF CITRUS RED MITE

HERBERT SPENCER and ALLEN G. SELHIME
United States Department of Agriculture, Agricultural Research Service, Entomology Research Branch

The citrus red mite,[1] known generally in Florida as the purple mite, has become a major pest of citrus, especially in the last ten years. Since 1913 the Subtropical Fruit Insects Laboratory at Orlando has conducted many experiments with insecticides and miticides for control of this pest, and also experiments designed to reveal the causes of infestation increases. Sampling methods have been devised to measure natural infestations and also the control obtained with the many treatments that were tested.

Sampling for reliable experimental data is at best a time-consuming and expensive work. Through the years several methods have been tried in a continuing effort to obtain more reliable data at less cost of time and labor, and to find a simple method that might be useful also to citrus growers in checking their own groves.

Experiments involving comparisons of insecticides or miticides for control of red mites are conducted in a single grove of uniform trees to avoid variations between groves. A randomized-block design is used (Spencer and Osburn, 1948). Ten compact blocks of trees are outlined on a map of the grove, each block including a tree for each treatment. By this method all treatments are subjected equally to any variations that may exist between different parts of the grove.

Our present method of estimating infestations has several advantages. We use a hand lens in the grove, and so avoid collection and transportation of samples to the laboratory and use of the microscope. We examine only top surfaces of the leaves, since that is where most of the red mite eggs and crawling stages are found. This is simpler than examining upper and lower leaf surfaces and fruits, and gives larger numbers and less variation for equal time spent.

The hand lens we use is a linen tester with frame having an opening, or field, one inch square. The opening is placed diagonally over the midrib on the upper surface of the leaf, and records are made of the numbers of crawling mites and unhatched viable eggs in the square. This is done for 25 leaves equally

[1] *Metatetranychus citri* (McG.).

spaced around the tree at chest level. Mature, hardened leaves just back of the tender new growth are examined, since tender new-growth leaves may not have been out long enough to develop infestations.

Adding the values recorded for each 25 leaves gives a tree estimate, or index, and adding the indexes of the 10 trees getting the same spray treatment gives the treatment index. This index may be compared directly with other indexes similarly obtained for other treatments, or those found before spraying or later in the year.

The treatment index numbers may be reduced to mites or eggs per square inch if desired, and such indexes may be compared with those obtained in other years in the same grove or in other groves. It is also possible to derive the percentage of leaves infested from the basic leaf records if this is needed for comparison with infestation records so summarized in former years.

Data from infestation estimates made by this new method are better suited for analysis of variance, calculation of experimental errors, and checking adequacy of sample size than data obtained by the percentage method. It is a method capable of showing very small difference in control from different miticides.

There is a decided advantage in recording eggs separately. By doing so one can decide on the probable red mite infestation trends in a grove. If there are fewer unhatched eggs than mites on the leaves, the infestation is probably declining naturally and spraying or respraying may be avoided. If the mites run more than two per square inch and eggs four or more, a large increase in infestation may be expected in the near future and immediate spraying is advisable. The index of infestation that calls for spraying can probably be set rather closely when additional data become available.

A grove owner can adapt the method by examining 25 leaves on each of ten trees well spaced across each grove. One man with a lens and notebook can examine ten trees in an hour and get information that will help him answer the ever-present question, "Shall I spray these trees for red mites now, or wait?" And he can come back ten days after spraying and determine whether or not his efforts have been successful.

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BOOK REVIEWS

It is seldom that an editor has the opportunity of reviewing two books whose authors are husband and wife. This unusual circumstance has come about through the publication of the books by the Goins within the past few months by two separate publishers. The high quality of both books is a reflection of the effects that may be achieved when husband and wife have similar interests and are both keen naturalists.

World Outside My Door, by Olive Bown Goin. viii + 184 pp., illustrated. The Macmillan Co., New York. 1955. Price $3.50.

"World Outside My Door" is the product of many years of observation by Mrs. Goin. Written with a style and vocabulary that is easily understood by the layman, the daily and seasonal life of the animals around her—mostly small things, frogs, lizards, turtles, songbirds and the like—comes vividly to life. The book contains original observations on the peck order of wild birds, the life history of *Bipalium*, a large terrestrial flatworm, the homing instincts of frogs, and many other phenomena that are overlooked by the casual observer.

Mrs. Goin received her biological training at Wellesley College, the University of Pittsburgh, and the University of Florida. She has worked as a biologist at the Carnegie Museum and the University of Florida. Presently, she is keeping alive her interest in natural history while carrying on the complex duties of a housewife.

Guide to the Reptiles, Amphibians, and Fresh-Water Fishes of Florida, by Archie Carr and Coleman J. Goin. ix + 341 pp., 30 figs., 67 pls. University of Florida Press, Gainesville. 1955. Price $6.50.

"This is a book about the backboned animals of the classes Reptilia, Amphibia, and Pisces that are known to occur in Florida." It is more than that, it is a book that should take its place in the library of both scientists and laymen interested in natural history and fishing. The book has been magnificently illustrated with drawings by Miss Esther Coogle and photographs by Dr. and Mrs. Roger Conant.

The introduction leads the reader gently into what could be an overwhelming book but one which the authors have made every effort to make as clear as possible to the non-biologist. The book is divided into three sections, each organized in the same manner—a glossary of terms, a key, an account of each species, and plates showing each species. Fishes are treated first, followed by amphibians, and then reptiles. An appendix gives the latest information on first-aid treatment of snake bite.

The high quality of printing and reproduction of figures in this book reflects most favorably on the publishers who have endeavored to give the public a book that is well worth the cost.—L.B.

NEWS AND COMMENTS

Mr. George B. Merrill, Chief Entomologist of the Florida State Plant Board, will retire from this position effective January 15, 1956. He has been a member of the staff of the Plant Board continuously since 1916. Mr. Merrill is also a charter member of the Florida Entomological Society and served as President in 1920, 1923, and 1924.

Dr. Louis C. Kuitert, Entomologist at the University of Florida Agricultural Experiment Station, expects to leave sometime during December for San Jose, Costa Rica. While in Costa Rica, Dr. Kuitert will be a participant under the terms of a contract that has been arranged between the University of Florida and the Ministry of Agriculture of Costa Rica. His mission will be to attempt to discover a suitable control under tropical conditions for the Mediterranean fruit fly, which is a pest of citrus, coffee, bananas and other tropical fruit in that country. Dr. Kuitert will spend a year away from Gainesville and will be accompanied by his family.

Dr. T. M. Dobrovsky, Assistant Entomologist at the Hastings Potato Laboratory, University of Florida Agricultural Experiment Station, is leaving in December to become a member of the staff of the Agricultural Division (Plant Protection), Food and Agricultural Organization of the United Nations at Viale delle Terme di Caracalla, Rome, Italy.

Many of our readers will undoubtedly note the absence of the "Black Leaf 40" advertisement from the back cover of the FLORIDA ENTOMOLOGIST. Tobacco By-Products and Chemical Corporation has helped to support our publication continuously from 1923 to March, 1955, through advertisement of its products in each issue. Nearly every number of the journal subsequent to September, 1926, has carried the advertisement on the back cover. Early in 1955, the Company was sold to the Diamond Alkali Company and has been renamed the Diamond Blackleaf Company with headquarters in Cleveland, Ohio. The members of the Florida Entomological Society extend their good wishes for continued success of the Company in its new organization.

MINUTES OF THE THIRTY-EIGHTH ANNUAL MEETING OF THE FLORIDA ENTOMOLOGICAL SOCIETY

The thirty-eighth annual meeting of the Florida Entomological Society was held in the Floridan Room of the Roosevelt Hotel, Jacksonville, during September 1st and 2nd, 1955. The meeting opened at 10:00 a.m., September 1st. Dr. F. Gray Butcher gave the presidential address. Twenty papers were presented before the Society, including two invitational papers. The invitational papers were "Progress of the Cooperative Economic Insect Survey Program," by Mr. Kelvin Dorward and "Hemiptera from the Apalachicola River Area," by Dr. R. F. Hussey.

A most enjoyable hospitality hour was provided by Industry followed by an excellent buffet supper at the hotel. More than one hundred members attended the meeting, which was considered by many members as one of the most successful meetings the Society has ever held. Much of the credit for the success of the meeting should go to Mr. M. C. Van Horn, Chairman of Local Arrangements, and Mr. G. W. Dekle, the Program Chairman.

The business meeting was called to order by President Butcher at 4:30 p.m., September 1st. The first order of business was the report of the Treasurer and Business Manager of the Society. Mr. W. P. Hunter gave the following financial statement and reported the Society to be in the best financial condition that it has been in years:

REPORT OF THE TREASURER-BUSINESS MANAGER FOR THE YEAR ENDING AUGUST 15, 1955

Receipts:

From residue from Hospitality Hour (last meeting)	$ 10.00
From residue of registration and banquet (last meeting)	53.67
From membership dues and subscriptions	737.10
From reprints and plates (sale of)	64.93
From sale of sets and back numbers of FLORIDA ENTOMOLOGIST	40.25
From advertisements in the FLORIDA ENTOMOLOGIST	681.50
From sale of Centennial Stickers	20.00
Sub-total	$1,607.45
Bank balance as of August 23, 1954	771.46
GRAND TOTAL	$2,378.91

Expenditures:

To Pepper Printing Co., Gainesville, Fla.	$1,229.20
To F. Gray Butcher, (Stamps and misc. expenses)	3.00
To U. S. Postmaster, Gainesville, Fla. (Stamps and cards)	29.90
To L. C. Kuitert (Refund on Centennial Sticker Expenses)	30.00
To Lewis Berner (Stamps and misc. expenses)	5.00
To Milledge Murphey, Jr. (Stamps and misc. expenses)	10.00
To Lincoln Memorial Library (Rare back numbers)	6.00
To Herbert Spencer (Refund for printing annual program)	37.50
To Chesnut Office Supply, Gainesville, Fla. (Office supplies)	9.52
To Parker Office Machine Co. (1 cabinet and office supplies)	39.14
To Chas. R. Stearns (Printing signs for Society)	12.36
To Mrs. W. P. Hunter (Misc. stenographic work)	5.00
To Franklyn Square Agency—Advertisement for Society	40.00
To Refunds to subscribers	3.50
To Bank charges of all kinds	8.79
Sub-total	$1,468.91
Bank balance as of August 15, 1955	910.00
GRAND TOTAL	$2,378.91

APPENDIX TO REPORT OF BUSINESS MANAGER FOR THE YEAR 1955

The following assets of the Society are not properly a part of the Treasurer but should be made a matter of record:

1. COLE-Steel filing cabinet for storage of envelopes and paper, correspondence, etc.
2. Two COLE-Steel filing cabinets for the storage of back numbers of the FLORIDA ENTOMOLOGIST.
3. Miscellaneous rubber stamps, files, etc.
4. Deposited to the credit of the Society with the Florida National Bank at Gainesville—Savings Account—the sum of $27.50 (Residue from Hospitality Hour of last year). See Journal—Page 41.

Mr. Norman Hayslip, Chairman of the Auditing Committee, reported his Committee had checked the records of the Treasurer and they were found in order.

President Butcher called for the Secretary's report. Secretary Murphey reported the Society had grown to 282 members, and that at a recent Executive Committee meeting the following items were passed upon: The report of the special committee for a constitutional amendment was accepted. It was suggested that in the future the Executive Committee act as the Membership Committee because only the Executive Committee could pass on new members. The Committee studied the proposal presented at the last meeting by Editor Berner that the Society publish supplements in the form of articles of interest which would be too long to go into the FLORIDA ENTOMOLOGIST.

The Committee felt the present constitution allowed for such publications if sufficient funds were available, provided such publications be approved by the Board of Managers. The Committee recommends the Board of Managers print the constitution of the Society, as amended, in the next issue of THE FLORIDA ENTOMOLOGIST. The Secretary made an announcement of the 10th International Congress of Entomology which is to be held in Montreal, Canada, August 17-25, 1956.

President Butcher thanked Herman S. Mayeux for the work of the Committee that aided the Cotton States Branch Meeting at Tampa.

The president brought up the proposed constitutional amendment on honorary members. He had the Secretary read the present constitution and then the proposed amendment. Dr. Weems moved the adoption of the amendment and was seconded by Dr. Wolfenbarger. The amendment passed.

The President called for new business. Dr. Griffiths said he wanted to bring up the subject of the Florida Agricultural Council for the Society to consider. He said the Horticultural Society was a member of the Florida Agricultural Council and he felt that maybe the Florida Entomological Society should be a member. He added he realized the Council was a political body and for that reason he felt some thought and discussion should be had on this subject before an effort was made to become a member.

Dr. Butcher thanked the officers for their support during the past year and he said he wanted to particularly thank Dr. Lewis Berner for his work in editing THE FLORIDA ENTOMOLOGIST. Meeting adjourned at 5:05 p.m.

The second business meeting was called to order by President Butcher at 11:15 a.m., September 2nd. New business was called for and Dr. J. T. Griffiths spoke for his proposal of the Society having representation on the Florida Agricultural Council. He said he had heard favorable comments in the hall of the Society becoming active in the Council. Mr. W. L. Thompson said he did not think the Society should become connected with the Council; that our membership was made up mostly of scientists, teachers and others who were devoid of politics; and that he felt we should let our members from Industry carry our part in the Council. Dr. Wolfenbarger said he thought we should study the proposal under consideration. He suggested a committee to study this idea and report back to the Society at the

next meeting the pros and cons of their findings and a favorable or unfavorable recommendation. Dr. R. M. Pratt said he felt the scientific members of the Society should not be involved; that he felt nothing could be gained by our being connected with the Council. Dr. L. C. Kuitert moved a committee of 3 members be appointed to investigate the matter and report back to the Society.

President Butcher called for the report of the Resolutions Committee. The Committee, consisting of D. O. Wolfenbarger, Chairman, A. A. Whipp and H. H. True, submitted the following resolutions:

Be It Resolved by the Florida Entomological Society:

1. That a special committee be considered to look into possibilities of publishing the proceedings of our annual meetings in a single number.
2. That a vote of thanks be extended to officers, individuals and committees of our Society, to the Management and Employees of the Roosevelt Hotel, and to the Jacksonville Tourist and Convention Bureau which contributed to the success of the 38th Annual Meeting, and to Industry for a most enjoyable Hospitality Hour.

The resolutions were adopted.

President Butcher called for a report of the Nominating Committee. Mr. W. C. Rhoades, Chairman, reported for the Committee as follows:

President	Herman S. Mayeux
Vice President	Milledge Murphey, Jr.
Secretary	Robert O. Kirkland
Treasurer and Business Manager	Harold A. Denmark
Executive Committee Member	W. P. Hunter
Editor	Lewis Berner
Assistant Editor	Norman C. Hayslip

President Butcher called for nominations from the floor. Mr. J. A. Mulrennan moved the Secretary be instructed to cast a unanimous ballot for the slate as proposed by the Nominating Committee. The motion passed. Mr. Rhoades then suggested that when the next list of members is published in THE FLORIDA ENTOMOLOGIST, the past Presidents be starred as an aid to future nominating committees.

Mr. Mayeux was escorted to the speakers stand where he thanked the Society for the honor bestowed upon him. He said he wanted to appoint a few committees before the meeting adjourned. The following appointments were made:

A special committee to develop a list of past presidents—Dr. Lewis Berner, Chairman, Dr. J. W. Wilson and Mr. Norman C. Hayslip.

A special committee to study the possibility of the Society being a member of the Florida Agricultural Council—Dr. J. T. Griffiths, Chairman, Mr. W. L. Thompson, and a third member to be appointed later.

A special committee to consider the publishing of the papers presented at the annual meeting in one volume—the present Board of Managers for Publications.

He appointed the Executive Committee to function as the Membership Committee for 1956.

President Mayeux thanked the State Plant Board for the use of their slide projectors for the Jacksonville meeting. He said he especially wanted to thank Mr. C. E. Brian for his publicity work for the meeting just completed.

The business meeting adjourned at 11:50 a.m.

MILLEDGE MURPHEY, JR.
Secretary

THE FLORIDA ENTOMOLOGICAL SOCIETY CONSTITUTION AND BY-LAWS

ARTICLE I

Name and Objectives

Section 1.—The association shall be known as The Florida Entomological Society.

Section 2.—The objectives of the Society shall be: (1) to promote the study of entomology; (2) to encourage research relative to insects and related Arthropods in Florida; (3) to distribute widely knowledge pertaining to insects; and (4) to publish THE FLORIDA ENTOMOLOGIST.

ARTICLE II

Composition of Association

Section 1.—The Florida Entomological Society is a statewide organization. It may recognize regional branches and may approve the affiliation of societies and organizations which are permanently established, provided the aims of these organizations are consistent with the aims of the parent organization. Branches or affiliated societies shall function under such agreements and understandings as may be entered into at the time of their organization or their becoming affiliated with the Society, subject thereafter to such subsequent modification as may be mutually satisfactory.

ARTICLE III

Membership

Section 1.—All persons having entomological trainng or a sincere interest in entomology may become active members of the society. Applications for

membership will be endorsed by two members of the Society, accompanied by the payment of the annual dues and submitted by the Membership Committee to the Executive Committee for action. The Secretary will notify the applicant of the action taken.

Section 2.—Honorary membership may be conferred by action of the Society on anyone who has performed distinguished service in the field of Florida entomology. Such individuals shall be required to have been active in entomological work for a minimum of 20 years. Any active member may propose the name of a person for Honorary Membership. The name shall be submitted to the Executive Committee. Upon approval by the Executive Committee, the name or names of the proposed individuals will be referred to a vote by the Society. Such vote to be a secret mail ballot at least 30 days prior to any annual meeting. Election to Honorary Membership shall require a two-thirds majority of those balloting. No more than two names may be voted upon in any one year.

Section 3.—Upon payment of one hundred dollars ($100.00) any active member may become a life member and shall thenceforth be granted the privileges of the Society, be exempt from annual dues, and supplied with THE FLORIDA ENTOMOLOGIST without further charge.

Section 4.—Members shall not use the name of the Society for commercial advertising. Such a practice shall constitute sufficient grounds for a recommendation by the Executive Committee that said member be dropped from the Society.

ARTICLE IV

Officers

Section 1.—The officers of THE FLORIDA ENTOMOLOGICAL SOCIETY shall consist of a President, a Vice-President, a Secretary, each of whom shall be elected annually; and a Treasurer, who shall be elected for a term of three years.

Section 2.—There shall be an executive committee consisting of the president, the vice president, the immediate past president, the secretary, the treasurer, and two active members, one of whom shall be elected each year to serve a period of two years. The president shall act as chairman of this committee.

ARTICLE V

Funds

Section 1.—The funds of the Society shall consist of two types:—General funds, and a permanent fund.

Section 2.—The general funds shall be collected, entered, disbursed, and accounted for by the treasurer and shall be available for current expenses.

Section 3.—The permanent fund shall include all donations, bequests, fees for active membership for life, and such other property or funds as may be added from time to time. This fund shall be left in custody of the treasurer. The principal of this fund shall be invested. The interest from the investment may be used to meet necessary expenditures, but if not used during the year it is to be placed in the permanent fund.

Expenditures from the principal of this fund are to be made upon the recommendation of the Executive Committee and the approval of the Society at any meeting. Notice of such proposed action must be given in the call for said meeting.

ARTICLE VI

Meetings, Quorum and Voting

Section 1.—There shall be an annual meeting. The time and place of such meeting may be decided by the membership at the previous annual meeting, or by the Executive Committee.

Section 2.—Special meetings may be called by the Executive Committee and shall be called by the president upon the written request of six (6) active members.

Section 3.—Six (6) active members shall constitute a quorum for transaction of business of the Society.

Section 4.—Voting and holding of office shall be limited to active members of the Society.

ARTICLE VII

Amendments

Section 1.—All proposed amendments to the Constitution shall be presented at the annual meeting. The president shall then appoint a special committee to consider said amendment; this committee shall report its recommendations at the next annual meeting. Each member shall be supplied with a copy of the proposed amendment at least thirty (30) days prior to the annual meeting by the secretary. A two-thirds vote of the active membership present shall be required to sanction a constitutional change. Minor changes in the proposed amendment may be made by the Society, during the course of its consideration.

BY-LAWS

ARTICLE I.

Section 1.—All members have equal privileges as to the presentation of papers and discussions at meetings.

ARTICLE II.

Officers and Their Duties

Section 1.—The president shall preside and deliver an address at the annual meeting over which he presides. He shall announce his appointment of the necessary committees at the first session of the annual meeting. He shall exercise such powers as are necessary to carry out his official duties.

Section 2.—In the absence of the president, the vice-president shall assume the duties of the president.

Section 3.—It shall be the duty of the treasurer to act as business manager of publications. He shall collect all monies due, pay all bills incurred by the Society, and submit a report at each annual meeting. His accounts shall be audited annually, which audit shall be submitted at each annual meeting.

Section 4.—The secretary shall make necessary arrangements for the meetings of the Society, keep a record of proceedings, and attend to general correspondence.

Section 5.—The Executive Committee shall transact the business of the Society between annual meetings. It shall make recommendations on policies to the Society and shall give an annual report. The Executive Committee may receive and approve or reject the reports of the standing or special committees. The committee shall hold an annual business session at the close of each annual meeting.

Section 6.—All officers and standing committees shall be elected by ballot, unless otherwise provided for.

Section 7.—All elected officers of the Society shall assume office at the close of the annual meeting, and shall serve for one year unless other provisions are made.

ARTICLE III.

Publications

Section 1.—The Society may issue a publication containing the transactions of the organization's meetings and such other matter as may be of interest to entomologists. A copy of each issue (THE FLORIDA ENTOMOLOGIST) shall be sent to each member of the Florida Entomological Society. The direction of the publication of the Society shall be entrusted to a Board of Managers, consisting of an editor, an associate editor, and a business manager, who shall be the treasurer of the Society. This Board shall be elected annually unless otherwise provided for. The official publication shall be issued at such intervals as may be determined by the Society or by the Board of Managers.

ARTICLE IV.

Dues

Section 1.—The annual dues of active members shall be $3.00, except for University or High School students who may affiliate with the Society by the payment of $1.25. At least three-fourths of said dues shall be used for a year's subscription to the FLORIDA ENTOMOLOGIST. Honorary members shall be exempt from payment of dues. Dues shall be paid annually in advance.

ARTICLE V.

Meetings

Section 1.—Special meetings may be called as provided for in the Constitution. Notice of such meetings shall be given by the Secretary at least ten (10) days prior to such meetings.

ARTICLE VI.

Amendments to By-Laws

Section 1.—Changes in these By-Laws may be made by a two-thirds vote of the members at any meeting; provided that notice in writing of the proposed change shall have been sent to each member at least ten (10) days before the date of the meeting at which it will be considered.

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Cockroaches	Sod Webworms
Cotton Boll Weevils	Southern Corn Rootworms
Crickets	Strawberry Crown Borers
Cutworms	Strawberry Weevils
Earwigs	Sweet Clover Weevils
Fleas	Tarnished Plant Bugs
Flies	Termites
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